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The Free Association in Method Psycho-Analysis

BY

GIRINDRASEKHAR BOSE

Psycho-analysis aims at finding out mental processes which lie beyond the range of our consciousness. An idea of the nature of the contents of the unconscious region of our mind may be obtained from various sources. A person who is trying to hide some thought from another, very often gives it away by a slip of the tongue ; similarly the unconscious thought may express itself in our mistakes and accidents and in unintentional acts as also in our behaviour during unguarded moments and emotional strain. Our unconscious thoughts have a dynamic quality and are continuously trying to find expression in consciousness ; they are only prevented from doing so by our cultural and moral ideas and tendencies which run counter to them. The human mind shows strivings of an opposite nature. These strivings may be socially classified as good and bad. The good elements in our nature are at continual war with the bad. The socially undesirable elements do not merely have a passive existence but always tend to gain control of the conscious self, so that directly the opposing forces are weakened, the bad element enters the conscious mental arena. The bad element may be compared to a piece of cork which has been kept submerged in water by an external force ; directly this force is released or weakened the cork tends to float up. Whenever the social forces are weakened as in times of war and strain, the gross side of human nature comes into prominence. It would be wrong to say that human nature is essentially depraved ; there are good elements as well as bad, and under normal social conditions

the bad is kept in check by the good. The mind of the average man has been so much moulded on social ideals that the worst side of his nature seldom finds opportunity of expression and its existence is very often forgotten ; the enemy has been successfully walled up and the conscious mind feeling the security of the safe side only of the barrier does not know that there are forces on the other side continuously straining to break through the wall ; the struggle is thus carried on all unknown to the conscious personality although originally the opposition was conscious. It is only when there occurs a breach in the wall as in certain types of mental disease that the struggle is felt. The nature of the struggle indicates the nature of the forces at war and an observer, from a consideration of the disposition of the conscious mental factors that have been arrayed to fight the hidden enemy, can draw a conclusion as to the nature of the contending unconscious elements. It is thus possible to get an idea of the nature of the contents of the unconscious mind of a mental patient from a study of his symptoms. The opposing forces, which keep the unconscious mental elements in check, have been technically called the censor. During fits of absentmindedness, emotional strain and sleep the censor is weakened and the unconscious repressed element comes out in consciousness. The functioning of the censor however is seldom entirely absent so that even when the unconscious element is able to elude the censor it cannot openly come out in consciousness, for directly it tries to do so the censor is roused to activity and it is promptly pushed back again. It can, therefore, only show itself under disguise. A disguised unconscious element is called a symbol, because it means more than the thing it directly stands for. The Union Jack is not a mere piece of multi-coloured rag ; it represents the strength of the mighty British Empire. There is, however, a difference between a symbol of this type and an unconscious symbol. In the first case the entire significance of the symbol is known,

whereas in the unconscious symbol the significance is entirely unknown. The behaviour of a person towards an unconscious symbol is just what the case would have been had its true significance been known. To the conscious mind, therefore, the attitude of a person towards a symbol seems unreasonable. A very brave woman may be mortally afraid of a rat ; this unreasonable fear appears perfectly justifiable when we find that the rat in such a case stands for something really dangerous. Psycho-analysts have been able to get at the meaning of many such symbols. It is a curious fact that some of these symbols are universal, that is, they have the same meaning in all cases. The fear of an illiterate Indian woman for a rat is traceable to the same source as the fear in an educated European woman, although the two are widely different socially and culturally. Such symbols originate from the deeper layers of the human mind,—layers which are not affected by our cultural environment.

Symbols are very plentiful in dreams and if we know the meaning of such symbols we can understand the meaning of dreams and can thus have an indication of the nature of the unconscious contents of our mind. Here then is another way to the unconscious. A person may not be able to remember his dreams or his dreams may be few and far between ; mistakes and accidents also may be rare ; if we had to rely merely on dreams and accidents to unearth the unconsious our difficulties would be very great indeed. We must therefore have at our disposal some other method which admits of more universal application. Such a method has deen devised by Freud, and it has been called the Free Association Method. Freud found out that if we allowed a free and uncontrolled expression of our thoughts, the unconscious element would tend to emerge and would direct the course of our conscious thinking to a great extent so that its indications would be more or less apparent. The term " association " is used in a technical sense by psychologists to denote the phenomenon

of one preception image, idea or thought bringing up into consciousness another image or idea or thought which is in some way related with it. A word or a thought may bring up a whole series of associations. If a subject be asked to allow his thoughts to flow only in a definite direction or in a definite way, the associations are said to be controlled; when we carry on a conversation with an acquaintance, say in a tea-party, we generally suppress thoughts of a private or purely personal nature; our social sense of propriety stands in the way of a free expression of our thoughts. Our associations are controlled associations in this case. When we are indulging in a day dream we do not allow our sense of reality or propriety or any other consideration to interfere with our fancy; the associations are not controlled in any way, they run a more or less free course. Such a type of association may be called free association. The term free association however is not very happy because no series of associations is ever entirely free. In the free association method of Freud the subject is asked to recline comfortably on a couch with closed eyes; the room is kept semi-darkened and no one else is allowed in the room so as to avoid all sources of distraction. The subject is asked to speak out whatever comes up in his mind. The subject is instructed not to direct his thoughts in any special direction; he is not to exercise his critical faculty in any way, he is not to judge whether a thought is relevant or irrelevant, reasonable or absurd or grotesque, decent or indecent, polite or otherwise. He should neither pause to consider whether a thought is complete or not, nor whether it is of a secret or private nature involving himself or some other person; there should not be any conscious hiding or distortion or suppression of anything on the part of the subject. He is to give free reins to his thoughts and is to speak absolutely without any reserve in order that a free association investigation may be successfully carried out. The subject is to discard all his social, moral and cultural

inhibitions for the time being so far as his thoughts are concerned. It will be seen that this attitude is difficult for the subject to take up unless he has got absolute faith in the psycho-analyst; in the first stage of experimenting or treatment the subject very often reports blanks, and his associations are seldom free; it is only after some time has elapsed and the patient has come to know the psycho-analyst and has been familiar with him that the associations become "free." The "free association" attitude is an artificially produced state in which the subject's anti-social thoughts and ideas, which run counter to his conscious waking personality, are given opportunity for expression. Of course, this expression is verbal and does not affect the domain of action. One of my subjects asked me whether he was to give out any abusive thought against myself and I replied in the affirmative; then he asked me again whether, he would be allowed to strike me if he wanted to do so. My direction was that he should certainly tell me of his intention to strike me, but he should not carry it out in action. The psycho-analyst should maintain an impassive countenance under all conditions and should not show his emotion in any way. It is best for him to take his seat at the head of the couch, so that he may watch the patient without himself being watched. It is usually taught that the psycho-analyst should mentally note down the thoughts given out by the subject and he should not attempt any writing as it is likely to disturb the subject. My own practice is to write down then and there whatever the subject might say, and I have found that after some time the subject gets himself reconciled to the idea and there is no obstruction to the free flow of his thoughts. This method has the advantage of doing away with all personal sources of error on the part of the psycho-analyst and a correct record is always available for scrutiny.

Besides the conscious sources of disturbance that I have discussed above there are other factors of an unconscious

type that might interfere with the free flow of thought in a subject. Whenever a repressed thought tries to come out in the open, it meets with a certain amount of opposition from the conscious mind; this opposition is technically called resistance and the function of the psycho-analyst is to remove the resistance. It sometimes happens that when an unconscious thought tries to gain an entry into the conscious mind in a more or less undisguised form during a free association test, the censor is suddenly roused to extra activity and forbids the emergence of all thoughts irrespective of their nature; the mind becomes an absolute blank. It is like the military prohibiting all visitors, friends and foes alike, inside a fort during a war. The thoughts immediately preceding and following a blank are, therefore, of very great significance to the psycho-analyst, as they are likely to give some indication of the nature of the objectionable element. The functioning of the censor is to a large extent automatic and is beyond conscious control and the subject cannot prevent it with the best of intentions from interfering with the free flow of association. The unconscious element generally comes out in some disguised form during free association.

When a free association test has been successfully carried out, the experienced psycho-analyst can detect the presence of an unconscious thread running through all the different thoughts. To a casual observer the thoughts appear to be disjointed and rambling. Before I proceed to illustrate this by an actual example it will be best to discuss the theory of free association.

It is a familiar fact that one thought recalls another and the same word might bring up different associations in different individuals or in the same individual under different conditions. The word 'pen' might bring up an association 'fountain pen' in one case, 'pencil' in another, 'paper' in a third, 'ink' in a fourth, 'writing' in a fifth, 'table' in a sixth, 'stationery shop' in a seventh and so on. Almost an

infinite number of associations is possible with a single word or a single thought. But the interesting point about this is that in a given case only one or a group of words come up in association with a single word. Why one particular word is selected out of a possible infinite number, and not another is a question that requires an answer, It will be noticed that the subject's personality, which includes the whole life history of the individual, and his mental attitude at the time of the experiment, are important determining factors. In response to the word 'pen' a pencil manufacturer is likely to think of 'pencil', an author of 'writing', an ink-dealer of ink and so on. If a geologist, a botanist, an artist and a military commander were asked to give a description of a country, each of them would utilize for his description certain special features of the place appealing to his special interest, and it would be quite easy to pick out the description of the one from that of the other. The peculiar bias in each case would be quite apparent. Similarly when we examine the thoughts given out in free association, we can detect an unconscious guidance. There is a conscious link between one thought and another in most cases, but there are some thoughts which seem to come up in consciousness without rhyme or reason; its connection with the previous thought is not understood. If we assume the existence of an unconscious trend in such a case, it may be possible to explain its appearance. If it is further seen that the assumed unconscious trend would give a satisfactory explanation for the whole series of associations, then its actual existence seems very probable, and if it gives in addition a suitable explanation for some peculiar aspect of the subject's behaviour, then the assumption becomes thoroughly justifiable. Of course, we must not expect that the patient's conscious introspection would support our assumption because we have placed it in the unconscious level. It very often happens that when the unconscious trend is laid bare by

such a procedure, the patient is able to grasp its nature and then it becomes conscious and can no longer be called an assumption; the subject's conscious mind is able to recognise its presence.

We shall understand the working of such an unconscious trend better, if we compare it with that of a conscious trend. A trend is something different from what I have described before as a link between two associations. The different thoughts are connected together by the links, whereas the direction of the entire chain is determined by the trend. A mathematician, for instance, in his conversation with a colleague may be talking of triangles and then his conversation might turn to squares, square-roots, functions, indeterminate quantities, etc. Besides the links, which can be easily recognised, connecting the different thoughts, one can distinguish a general trend which we might describe as the mathematical trend guiding the formation of the links in a definite direction and preventing it from turning into other possible channels. A subject who has got a repressed cruelty element in his nature struggling for expression would, in his free associations, give us thoughts of cruelty situations of different types which may be quite unconnected with one another and the subject may not have the least conscious idea that the thoughts have an element of cruelty in them unless his attention is specifically directed to this by the analyst. It is quite possible that more than one conscious trend may be unearthed in a given series of associations and these different trends again may be traceable to a still deeper unconscious root. Trends having varying degrees of unconsciousness are found during analysis.

The free association method has been utilized with remarkable success in unravelling the mystery of dreams and psychoneurotic symptoms and in bringing back forgotten experiences of a certain type to consciousness. In the analysis of dreams, the subject is asked to relate the dream

which the analyst notes down just as the subject recounts it. The dream narrative is then divided into several small portions and the subject is asked at first to concentrate his mind on a given portion of the dream and then to let his mind wander and give his free associations. This process is repeated with the other portions of the dream till the whole dream has been dealt with. A careful examination of the associations thus obtained, coupled with a knowledge of the subject's life history, enables the analyst to find out the meaning of the dream.

When a subject has given out all his associations with reference to a particular situation, or word, or a part of a dream his thoughts come to an automatic end, and the experienced analyst knows that he has got all necessary information on the point. It sometimes happens, however, that the thoughts go on without coming to a stop and then from practical considerations the analyst has got to stop the flow somewhere. Here again the experience of the analyst tells him when to interfere.

To the person who submits himself to the free association test for the first time, the interpretation of the analyst may not seem to be convincing, but as the analysis proceeds from day to day and more and more evidence comes up in support of the interpretation from many different sources, the cumulative effect becomes overwhelming, and the subject is forced to admit the truth of the interpretation. If the unconscious trend comes up in consciousness, there results a direct appreciation of the analyst's interpretation. There is a difference between acknowledging the truth of a statement from the force of reason alone and that from direct personal appreciation. We may be convinced from chemical tests that a substance before us is sugar and is sweet, but to experience the sweet taste actually is something different. When all resistances have been removed in the course of analysis, there is a direct appreciation of the hitherto

unconscious trend which is thus rendered conscious and is then dealt with suitably by forces at the disposal of the personality. There is a good deal of difference between a conscious adjustment of this type and a compromise arrived at in a fight with an unconscious element.

The following is a series of associations given for the first time by a normal person who submitted to the experiment for the purpose of this paper :—

"C. Hotel—Shibtola—Uttarpara, Kali Pujah fireworks—Radhabazar—watch—cabbage—cloth—(blank)—Mr. G.—adopted son—mother's illness—nephew has got fever—will come on Saturday—Sunday—religious ceremony—office closed for two days—shall go to S—Civil Surgeon—Mr. M.—Mr. H—Santragachi—aunt."

The subject works as a book-keeper in a Calcutta office and, in his spare time, works at the C. Hotel. Recently there was some family dissension and, to avoid unpleasantness, the subject left his joint family home with his wife and rented a house at Baranagore which is a few miles to the north of Calcutta. The subject daily comes to Calcutta to attend office in a steamer which plies between Shibtola and Calcutta; Uttarpara is a station on the steamer route. The free association experiment was done on the Kali Pujah day when it is customary to let off fireworks. The subject left a watch for repair at a shop in Radhabazar, a business quarter of the town. Mr. G. who invited the subject on the occasion of an "adoption" ceremony, lives almost opposite the subject's original home where the subject's mother lives. The nephew stays with the subject at Baranagore. The nephew was expected to come with the subject to his mother in connection with a religious ceremony. The subject wanted to go to S for a trip during the period the office remained closed. The subject wanted a medical certificate for a friend of his and for this he thought of taking him to the Civil Surgeon with an introduction letter from Mr. H—another Surgeon who was on

friendly terms with the Civil Surgeon. There was the thought of going to Mr. N.—his family physician in the first instance and, failing this, of approaching Mr. H. Santragachi is a village a few miles to the south of Calcutta ; the subject had to go to his aunt who resided there.

The subject came to my place from the C. Hotel in the evening when I asked him to sit down for the experiment. The associations " C. Hotel—Shibtola—Uttarpara " stand for the route—Calcutta to Baranagore—which the subject has to traverse daily. " Kali Pujah fireworks " was recalled in connection with his presence that eveing in the C. Hotel where fireworks were let off. Then the thought of taking with him some cabbage and cloth according to the instruction of his wife came up just preceded by the thought of the watch for which he had to go to Radhabazar. Next the thought of Mr. G.'s invitation came up, followed by the thought of mother who was staying in the joint family house. It would be quite justifiable to assume that the subject was describing, without knowing it, the route he had to traverse almost daily. The idea of the invitation and the illness of his mother whom the subject had to visit frequently suggested the necessity, as well as the difficulty of coming all the way from Baranagore; this assumption is further supported by the thought of his nephew whom he would have to escort the next day; after this the thought comes of a long distance trip which had a few unpleasant associations. Then comes the idea of running from one doctor to another—an entirely thankless task. After this again comes the thought of the necessity of going to Santragachi which is a long way off from his place. The association was stopped here by direction. Analysing the above we detect an undercurrent of resentment in having to travel such long distances. When this was explained to the subject he readily admitted the truth of it. The resentment idea was not present in his mind when he gave the association and was, therefore, unconscious at the moment. It will be

noted that many of the associations had to be amplified by the subject before an interpretation was possible. The psycho-analyst must be in the possession of all conscious information before he is justified in venturing an unconscious explanation for a given series of associations.

We shall close this study with an actual illustration from a case history. The following associations were given by a patient suffering from periodic fits of depression :—

"My mental condition is not good to-day, worries about my wife's health are very distressing. She had fever for a day—she is bloodless—asked a friend whether she would develop consumption—he said she might—doctor said no—have made an appointment with the doctor again to-day. I am very much anxious about her, she usually works hard—she is in bed now—sometimes the thought comes to me that she will develop phthisis and at other times I think she will get mad—if she dies all home comforts would be at an end—yesterday the worry was not acute, to-day it is intense—slept well last night but, after I saw wife at 10 o'cleck, the worries appeared—I have no mind for work—no interest for anything—don't know what the fates have in store for me—am feeling a nervous sensation all over the body—this is the limit of suffering—there is no hope in this life and I am apprehensive of death—a funny thought came during the day—as if my wife was very much emaciated and had diarrhœa—what shall I do if she dies—I cannot marry again—I have already married twice."

The reader, who carefully follows the associations given above, will notice that the subject at first manifests an undue anxiety for his wife's health and imagines her to be attacked with phthisis and madness and later on with diarrhœa. This unjustifiable picturing of dangerous situations is regarded by the psycho-analysts as originating in a death-wish directed towards the wife. The idea of death comes up only in the associations, but at first the fear becomes linked with the

possibility of the subject's own death, after this the resistance seems to weaken and the death idea becomes attached to the wife. The subject never had the least conscious idea that he was harbouring such a dangerous wish towards his wife. He had all along been a loving husband, paying more than the ordinary amount of attention to his wife. The conscious appreciation of this death-wish towards the wife came long after this analytical disclosure.

Evanescence in Reading

Michael West and Hem Chandra Banerjee

The Teachers Training College, Dacca

A child fails to remember the substance of what he has read for one of two reasons :—

1. He reads the words, but he fails to derive from them any meaning; so that the ideas have never really entered his mind at all.

2. He reads and obtains the ideas; but the ideas subsequently slip out of his mind before he reviews the substance of what he has read. (Or the ideas are driven out of his mind by subsequent incoming impressions before the 'review').

We have applied the term *Evanescence* to this second phenomenon, namely, the disappearance of ideas gathered in reading in the interval between the reading and the review. We have further endeavoured to measure the amount of such Evanescence in various situations. This measurement is made by requiring the subject to underline in the text the answers to questions supplied with the reading matter; on the completion of the reading the text is taken away, and the subject writes the answers to the same questions from memory. The difference between the percentage of correct underlining and the percentage of correct written answers measures the amount of Evanescence. In one such experiment the mean percentage of correct underlining was 83·3, Written Answers, 54·1, Difference 29·2; in another experiment Underlining, 71·3, Written Answers, 52·3, Difference 29·0. These experiments have already been reported elsewhere.*

As we read we tend ordinarily to express the ideas gathered, (or at least the more important ideas) in words mentally, as a kind of running review. It appeared likely

* Bilingualism, Govt. of India, Occasional Reports, pages 168-170.

that Evanescence might be particularly liable to take place where the ideas gathered in the course of reading are not mentally re-expressed in words, or where there is some obstacle standing in the way of their being re-expressed in, or attached to words. Such wordless, or 'disembodied,' ideas might particularly liable so to slip away.

Where a person is reading his mother-tongue the union between words and ideas is naturally very close: but where a person is reading a foreign language in which he has very little power of speech, the ideas gathered in the foreign language have to pass over into another language, the mother-tongue, before they can be re-embodied. We expect, therefore, that Evanescence will be considerably greater in the reading of a foreign language, especially one in which reading-power is in excess of speaking-power, that it is in the reading of the mother-tongue.

The experiment, whose results are shown below, was conducted on the lines already described; but in the one case the subjects read in their mother-tongue, Bengali, and in the other case they read in English. In each case the questions were in the same language as the text.

	No. of cases.	Mother Tongue.				Foreign Language.				% Difference bet. underlining & answers.	
		Underlining (8).	% Correct underlining.	Answers (8)	% Correct answers.	Underlining (8).	% Correct underlining.	Answers (8)	% Correct answers.	Mother tongue	Foreign Language.
B. T. students, 1924-25	29	7·4	92·5	7·4	92·5	7·2	90	6·7	83·75	...	6·25
B. T. students, 1925-26	11	7·8	97·5	7·2	90	7·7	96·25	6·7	83·75	7·5	12·5
Dacca Inter. 1st Year, 1925-26	19	7·4	92·5	7	87·5	7·2	90	7	87·5	5	2·5
Matric. Class X ...	25	7·2	90	6·5	81·25	6·8	85	4·9	61·25	8·75	23·75
Class X (a good school)	41	7·2	90	7·1	88·75	6·5	81·25	5·8	72·5	1·25	8·75
Class IX (an average school)	15	7·2	90	6·6	82·5	5·3	66·25	4·5	56·25	7·5	10
	140		91·45		87·45		84·49		74	4	10·49

All the persons used in the above experiment possessed some speaking-power in English although their reading power was, as always, considerably in advance of it. We believe that with a class so trained as to have the maximum of reading ability with the minimum possible speaking-power, this phenomenon would be even more marked. We hope to have available next year certain materials whereby such pure reading ability can be produced in a foreign language, and to try this further experiment then. [It appears from observation of experimental classes that this disability can very easily be overcome by means of specially designed practice.]

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The Vocabulary of a Bengalee Girl

BY

GOPESWAR PAL

University of Calcutta

The importance of the study of Children's Vocabulary with a view to trace through it an aspect of development of Child's mind has been well recognised by modern Psychologists, and it justly forms today a chief item in all programmes of work connected with Child-study. The works of Tracy, Kirkpatrick in America, Sully in England, Lobisah, Sigismund and Preyer on the Continent are well-known. These valuable materials however lie totally unheeded in this country. It is hardly realised that a properly conducted investigation in this direction would lead to a deeper understanding of the child's mind.

The conditions under which an Indian child grows differ markedly from those that prevail in the West and the results to which these investigations may lead, may keep to guard against all hasty generalisation or to give a surer foundation to the principles already gained. The environment of linguistic sounds to which an Indian child is called upon to adapt itself is markedly different from that of the Western child. There is no proof as yet that the physical development in the two instances follows the same course. The physical and social objects to which the child is to react, as well as the modes of social behaviour vary widely in different countries. A study of linguistic and phonic development would thus bring into relief the processes that are socially determined and those that are conditioned by the general laws of psycho-physical development.

Method of Study

The method generally employed in such studies cannot be any other than that of patient observation. But there are small variations in the manner in which the observations are taken that influence the value of the data. In the first place a child may be observed for a limited time every day for a period and the records obtained by a number of observers from a number of children may be collated. The advantage of this procedure consists in the elimination of the factor of individual difference. Its shortcoming consists in the possibility that the child may be dominated by a particular interest at the time of observation and thus the record may not give a fair sample of child's linguistic mentality. A second method is to observe a child throughout its waking hours. Its advantage consists in the fact that the record presents a complete linguistic biography of the particular child for the period of observation. Its disadvantage lies in the fact that only a very small number of children can be studied in this way. Further such a study is possible only for the parents or near relatives of the child. The observers are thus likely to be prejudiced in favour of the child's achievement. At the same time a greater familiarity with the habit of the child would make the task of the observer easy in this case. If the observer could divest himself of the natural bias, this method would yield valuable data. In the present instance, the writer of this paper being a psychologist, the results may be presumed to have been little influenced by this course of error.

I undertook to study for a period of a fortnight all the words and sentences of a healthy girl fortyone months old. She belongs to a respectable educated Bengalee family. The child used to get up at about five in the morning and go to sleep at about twelve at noon. She was kept under observation during this period and all that she said as well as her

general behaviour was noted down. The same precedure was followed in the afternoon. The task was not at all an easy one. Any one who has ever tried to observe children for any protracted period knows how difficult it is to follow them in the rapid change of mood and interest, in the sudden shifting of direction of activities and consequently in the expression of ideas. There are also difficulties in the matter of perception and recording. It is extremely difficult at times to catch the correct intonations of the words uttered and to record them. It is a work that takes to the utmost, the attention and patience of the observer.

Results and Treatment

1124 sentences were recorded during the fortnight of investigation. 28% of these were found to be incomplete. (See Table No. II). The arrangement of words is influenced largely by interest. Sometimes a single word with due inflection and gesture represents a whole sentence. Sentences were often repeated, and in such cases there was a repetition only of the significant verb. The idea present in the mind was often first expressed in the order of time. The girl naturally made mistakes in the use of verbs with proper declinations and pronouns with inflections (*e. g.*, khāōnā instead of khābō nā...āmirā in the place of āmrā). The total number of words used by the child was 3891. The actual number of different words however that comprised her vocabulary was 328 only. All modifications of one word, *e. g.*, of a verb (will go, have gone, am giong, and went) and of a pronoun (his, him, etc.) have been counted as one word.

These words were classified according to their parts of speech as also according to their initial sounds in the Table No. I.

TABLE I.

The number of words arranged according to their initial sound under the different parts of speech.

	Noun	Pronoun	Verb	Adject.	Adverb	Conj.	Prep.	Intj.	Total
*â	2	1	...	...	...	...	...	1	4
ă	6	7	4	...	1	1	...	2	21
i	2	1	...	...	1	..	...	...	4
u	3	2	1	...	...	...	...	1	7
æ. ē	...	7	1	1	12	..	1	3	25
ăi	...	2	...	...	...	...	...	...	2
ō	3	5	...	...	2	...	...	4	14
k	16	...	4	1	6	...	...	...	27
kh	7	...	4	...	...	...	...	...	11
g	8	...	2	...	1	...	...	2	13
gh	3	...	...	...	...	...	...	...	3
c	5	...	2	1	...	...	...	...	8
ch	8	...	4	2	...	..	...	...	14
j	7	...	2	...	1	...	...	...	10
jh	1	...	...	1	...	...	...	...	2
ṭ	1	...	1	...	2	...	...	...	4
ṭh	3	...	...	...	...	...	...	...	3
ḍ	2	...	1	...	...	...	...	...	3
ḍh	...	...	1	...	...	...	...	...	1
t	4	14	1	1	6	...	...	...	26
th	1	1	1	1	...	...	1	...	5
d	5	2	3	...	...	...	1	...	11
dh	...	...	1	...	...	...	...	...	1
n	5	1	4	1	3	...	...	...	14
p	6	...	7	2	1	...	...	...	16
ph	2	...	1	...	...	...	...	...	3
b	22	...	8	...	...	...	...	...	30

* Phonetic signs as employed in "Origin of Bengali Language" by Prof. Sunitikumar Chatterjee, published by the Calcutta University Press.

TABLE I—(*cont.*)

	Noun.	Pronoun.	Verb	Adject.	Adverb.	Conj.	Prep.	Intj.	Total.
bh	3	...	1	2	...	...	...	...	6
m	12	...	2	...	...	...	...	...	14
r	...	...	2	...	...	...	...	1	3
l	...	...	...	...	...	...	...	...	0
ś ṣ s	3	2	3	1	...	...	...	...	9
h	5	...	2	...	6	...	1	...	14
Total	155	45	63	14	42	1	4	14	328

TABLE II.

Character of Sentences: Total 1124 Sentences.

Assertive Sentences	18%	Incomplete Sentences	28%
Command or wish „ ...	48%	Negative Sentences ...	58%
Questions ...	33%		

TABLE III.

Percentage of different parts of speech in relation to the total vocabulary (328 words).

Nouns.	Verbs.	Pronouns.	Adverbs.	Adjectives.	Interject.	Preposit.	Conjtn.
44·2%	19·2%	13·7%	12·8%	4·2%	4·2%	1·2%	·03%

It is interesting to note here the relative frequency in percentages of the different parts of speech of 3,891 words used during the period of observation.

TABLE IV.

Frequency of the use of different parts of speech.

Verbs.	Nouns.	Pronouns.	Adverbs.	Interjtn.	Adjective.	Conjtn.	Preptn.
40%	24·3%	16·7%	15.3%	1·9%	1·6%	·06%	·05%

On the perusal of these two tables it is clear that verbs and adverbs were more often repeated than nouns and adjectives.

Let us now consider the different parts of speech and the nature of the words used under each of them.

Nouns :—

Almost all of them were names of familiar objects. They were invariably used in the singular number and in the objective cases.

Verbs :—

The majority of the verbs represented giving, taking, doing coming, eating, beating. The following table gives the frequency of some of the oftner used verbs :—

To Give.	To See.	To Do.	To Come.	To Take.	To Go.	To Eat.	To Beat	To Be.
12·5%	11·8%	9%	8·6%	5·5%	5·2%	4.2%	2·6%	4·8%

Fifty-four other verbs were used giving an average percentage of ·7 only. Almost half of the verbs (44.6%) were used in the imperative mood and about 25·4% in the first person future tense. Verbs of past tense had been very rarely used. We give below a table of the verbs classified according to their tense and person.

	Future tense.	Present Tense.	Past Tense.
First Person ...	25·4%	6·5%	2·8%
Second Person ...	5·1%	44·6%	0
Third Person ...	3·8%	6·8%	4·6%

Pronouns :—

The majority of Pronouns used was in connection with self I, me, we, &c. which is just what is to be expected from a child passing through the egoistic period of development.

Adjectives :—

These were few in number and were very seldom used. They denote mostly size.

Adverbs :—

The Table below gives the frequency of some of the oft used adverbs.

ēmni	kænō	kakōn	ēkānē	nā	bēś
Thus	Why	When	Here	No	Yes
16%	12%	8%	8%	28%	20%

Of the other 36 adverbs the average frequency is 2%.

The adverbs were always accompanied by descriptive gestures, especially (thus) ēmni, when the girl invariably demonstrated how the thing was to be done.

Conjunction :—

Our observation corroborates Sigismund's, as well as Tracy's observations that the use of conjunction is very difficult. There was only one conjunction, namely, ār (and)

Prepositions :—

As regards prepositions it should be remembered that the number of preposition in Bengali is very small. The idea of preposition being conveyed by means of inflections. Only 4 prepositions were employed.

Interjections :—

With the exception of rē and gō the other 12 interjections were the primitive vowel sounds, *e.g.*, œ, ū, ō, å. Moreover these were invariably pronounced with nasalisation. The attached table gives the frequency of some of the interjections.

œ	œi	ō	gō	rē
30%.	5%,	24%.	15%.	10%

Let us consider the data from the standpoint of ease or difficulty of pronunciation of various sounds. The following table shows the frequency of the various sounds as initial. :—

TABLE V.
Of 3,891 words.

11·4%	begins with	k	2·5%	begins with	c
8·8%	...	b	1·8%	...	bh
8·1%	...	p	1·5%	...	j
7·4%	...	d	1·3%	...	th
6·1%	...	ã	1·1%	...	d
5·5%	...	m	.9%	...	ṭ
5·5%	...	h	·9%	...	ṭh
4·8%	...	æ	·9%	...	å
4·6%	...	kh	·9%	...	dh
4·4%	...	n	·7%	...	ph
4·4%	...	g	·7%	...	gh
4·2%	...	t	·7%	...	i
3·7%	...	ch	·7%	...	r
3·3%	...	õ	·3%	...	jh
2·5%	...	śṣs	·1%	...	dh
2·5%	...	u	0%	...	l

There is a general agreement in regard to the frequency of initial sounds between this series of observation and that of Tracy. The only exception occurs in the case of s sound which has a much larger frequency in the cases studied by the western observers.

A study of the sounds mispronounced and of the substituted sounds gives a more correct indication as to the nature of the difficulty of pronunciation.

TABLE VI.

Mispronounced nitial Sounds.	Substituted Sounds.
r	a
l	n
jh	j
gh	g
bh	b
kh	k
d	ḍ
ḍ	d
e	t
j	d
s	ch
ō	t, u
ē	t
t,	u
i	u
u	ō

TABLE VI (*a*).

Mispronounced medial Sounds.	Substituted Sounds.
e	æ
dh	d
bh	b
kh	k
ṭh	ṭ
ch	c
ṭ	t
l	r
g	ō
st	tt
sk	kk

The order of difficulty may be determined by calculating the percentages of the mispronounced sounds, the order according to this observation being l, r, ś, jh, gh, ē, j, c, bh, i, kh, ṭ, ō.

Summary of Results

(1) The total number of sentences studied is 1124 and that of words 3891. The total vocabulary consists of only 328 words.

(2) Sentences signifying negative preponderate being 58%. Those expressing command or wish come next (48%). Queries come up to 33%.

(3) About half of the vocabulary consists of nouns, being names of objects.

(4) Verbs however are most frequently used though they constitute only 19% of the total vocabulary. The nouns are less frequently employed. Roughly speaking, each verb is employed 2 times and a noun only ·5 times.

(5) The verbs are mostly used in the present and future tense. The latter is most frequently employed in the first person and the former in the second person. The past tense is very little in use.

(6) The sounds k, b, p and h occur most frequently as initial and the sound of s-occurs less frequently.

(7) The sounds l and r are most frequently mispronounced, the former being replaced by n and the latter by â.

A Report on the Application of the Stanford Adult Tests to a Group of College Students

BY

HARIPADA MAITY, M. A.

Laboratory of Experimental Psychology, Calcutta University

Object of the investigation:—

This paper presents a preliminary report of the application of the Stanford adult tests to a group of students of the Calcutta University.

Subjects:—

The tests have been applied to 34 students. Of these one was an undergraduate who had to give up his studies on account of Psycho-neurotic troubles. Another student had a temporary but severe attack of delusional mania before the Tests were applied. Since then he has been going on with his class work. The records of these two subjects have been presented separately for the purpose of comparison. The records of the remaining 32 subjects have been grouped together. The physical ages of the students examined range from 19 years to 26 years 11 months, the average age being 21 years 7 months and 12 days.

Procedure:—

At the beginning of the examination 7 tests from the "average adult" group and 3 tests from the "Superior adult" group were applied. But it was found, after a few cases had been examined, that some students could not achieve even a

fair score in the average adult group tests. Hence, the fourteen year group tests were also included. The total list, therefore, includes

14 year Tests	Average Adult Tests	Superior adult Tests
Test No. 1, 3, 4, 5, 6, Adult 1	1, 2, 3, 4, 5, 6, Adult 2	1, 2, 6.

Altogether sixteen different tests were applied. But in a few cases some of the tests were not continued either because there was a want of interest on the part of the subject or because there was some sort of interruption. The tests were partially applied in about 25% of the cases only. The mental age in such cases was calculated according to the usual method of distributing the total credit of the year to the tests actually used.

The verbal tests, *e. g.*, the vocabulary tests, and test no 4 of the "Average Adult" group, requiring difference of pairs of abstract words, had to be considerably modified. A test of vernacular vocabulary and of pairs of vernacular abstract words were substituted. As it was found after a few applications that some of the subjects experienced difficultly in understanding stories and instructions given through the medium of the English language, the vernacular was mostly used during the examination. The vocabulary list of 100 words was compiled by selecting the last word of every tenth column of a Bengali dictionary, containing approximately 20,000 words. As norms of Bengali vocabulary for the two different grades of adults have not yet been determined, it has been merely accepted that the American norms are applicable in Bengal. Most of the words in current use in the vernacular are derived from Sanskrit roots and are formed by adding prefixes and suffixes to these roots. As such, the number of words known, on the average, by a normal individual may be expected to be higher in India than in English-speaking countries. It seems, therefore, that the Terman standards of vocabulary

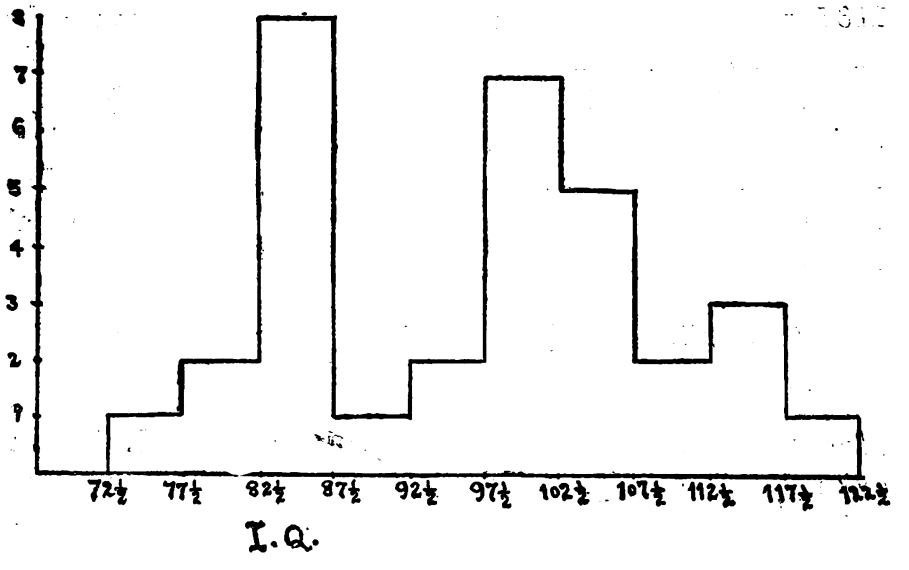
would not be too hard for our adults. In the place of four pairs of contrasted abstract words, five pairs were given. These five pairs were finally selected by four Sanskritists of the University. The four pairs of abstract words used by Terman were also used. The students experienced greater difficulty with them than with the corresponding vernacular pairs, the relative scores being 37% as against 59%.

The Tests were applied and all the calculations made by the writer himself. The procedure of applying the tests as advised by Terman has been followed in all cases, except that some of the tests had to be put a second time in the case of the Psycho-neurotic subject. This had to be done because it was found that he could hardly give his attention to the Constructional tests and the tests of Memory. The total time taken by an individual subject varied from about 60 to 100 minutes, the average time taken being 82·5 minutes. The examination was conducted during the two months of October and November in 1925.

Results.

Intelligence of the Group:—

The average mental age of the 32 students tested is 15 years and 5½ months, and the I. Q. of the entire group is 95. The mental age ranges from 12 years and 4 months to 19 years and ½ month; the I. Q. from 77 to 122. Only four individuals are of superior Intelligence, 50% are of average intelligence and 37½% are mentally dull. Evidently the average intelligence of our group is very low. There is a retardation of more than 6 months on the average.



Comparing our results with those reached by Coover and Downey, we find that the average intelligence of the subjects under examination is considerably lower than that of the groups of students from Stanford and Wyoming. The median I. Q. of Coover is 113 and the lowest I. Q. is 94. Downey's median I. Q. for freshmen 104 and for upperclass men 108.

Let us here pause for a remark. It is held, as Terman says, that "the student bodies of colleges and universities are recruited mainly from those whose intelligence is considerably above the median for people in general." It may be expected, therefore, that the large majority of college students should score higher than 110 and that, as Terman puts it, "an individual testing much below 90 will not ever be able to satisfy the requirements for college graduation." Our results show that there are 37½% of students below this minimum I. Q. 90.

If we examine the mode of distribution of I. Q.'s in the group, we find that it is not symmetrical. We can divide the entire group into three subgroups—superior, medium, and dull. The average I. Q. for the superior group is

116·2, that for the medium group is 101·2 and that for the dull group 83·7. The histogram shows that the mode for the dull group is the highest. When the I. Q. of the entire group is thus analysed into three levels, the medium level of intelligence of our group seems to have a very low figure in comparison with the intelligenee of ordinary normal adults of other countries.

Correlation of I. Q. with estimate of Intelligence.

To have a rough measure of the reliability of the tests taken together, the coefficient of correlation of the I. Q. with estimates of intelligence was calculated. The teacher whose estimation has been taken knows most of the subjects personally; he has not given his opinion on those with whom he was not sufficiently acquainted. As the teacher could give only the relative position of the various subjects in the scale of his estimate, the Rank-difference method of calculating the coefficient of correlation was adopted.

$$e = \cdot 50 \quad \text{P.E.}e = \cdot 1029$$

This shows that our results have shaped fairly well with the estimate of the teacher based on a prolonged and regular acquaintance. The studies of Caldwell and Downey report ·47 and ·53 as coefficients of correlation respectively. The agreement of our results on this point with similar studies in America indicates that possible error of the scale as a whole applied to a new set of students in a country of different social and educational conditions has not been much greater than in the land of its birth.

Distribution of scores in the special Tests.

Following Miss Caldwell's plan, we have classified the tests into four main divisions according to the mental trait that is required for passing them, *viz.*, Verbal tests,

Constructional tests, Immediate memory tests and Arithmetic tests. In table I the tests are arranged under special groups. There are 6 Verbal tests, 7 Constructional tests, 2 Immediate Memory tests and 1 Arithmetic test. The table shows the percentage of scores in the respective tests, achieved by the entire group as well as by the three classes of students—Superior, Medium and Dull.

The group has, in general, poorer scores in the constructional tests than in the other kinds of tests. This fact is of special interest. Does it imply that these individuals possess less constructive ability, practical imagination and power of mentally manipulating and constructing things? The verbal tests also seem to be more difficult for our students than for the American adults. Only 14 % of the students have a vocabulary of more than 13,500 words and only 35 % a vocabulary of 11,700 words. So far as the verbal tests are concerned, students both of the superior and the medium grades have done fairly well except in the Fable test in which the medium grade has obtained a rather poor score. The Fable test seems to measure the power of learning the right thing from others' examples, and it is curious that so many individuals of average mentality should fail in this. The immediate memory and arithmetic tests seem to have been easy. The results of test XVI Alt. 2 are of special interest. It requires an understanding of physical relations. All the students tested have passed through a science course of two years, during which the principles underlying the physical relations of the test have to be learnt. But curiously enough, only 19% of the entire group could barely pass the tests.

The students of the superior group have done more or less uniformly well. Those of the Medium group have done badly in the Fable test. (XVI) Problem questions test, Problems of the enclosed boxes test, Code test, XVI 6 Ingenuity test and specially in Comprehension of physical

relations test and Binet's paper-cutting test. These tests involve higher mental functions, such as comprehension, inference, and constructive imagination, and it is in these functions that the bright students have an advantage over the moderate and the dull. The dull group has shown a uniformly poorer result except in the Arithmetic test and Reversal of hands of clock test. It is interesting to note that about 70% of the adults tested, understand two fundamental differences between 'King' and 'President.'

Finally, the two peculiar cases, one of psychoneuroses and the other of psychoses, give us interesting points for comparison. The I.Q. of the psychoneurotic is 105, the mental age being 16 years and 6 months. He passed all the tests of the 14 year group except one, and all of the 16 year group except two. He answered all the 3 problems requiring comprehension of Physical relations. The tests in which he failed were of simple constructive imagination and of memory. The trouble with him during the tests was one of keeping himself alert; his attention would always rove. The psychotic obtained an I.Q. 100. He answered all the 'ingenuity problems' and one question of physical relations ; but curiously enough, he could not point out a single difference between 'King and 'President." These two cases illustrate that the defect of the neurotic is not intellectual.

To sum up,

(1) There is a retardation of more than 6 months on the average in the group tested. This was found on analysis to be due to the presence of a large percentage of Dullards in the group.

(2) There are three grades of intelligence—'Superior,' 'Medium' and 'Dull,' in the entire group. Their I.Q.'s are characteristically different.

(3) Our finding on the correlation between I.Q. and teacher's estimate of intelligence agrees with results of other

workers. Error of the scale applied to the group does not seem to be large.

(4) The group has done worse in constructional tests than in other kinds of tests. Psychological characteristics of the three classes of students discussed in the light of the distribution of scores in the special tests. The superior group generally excels the other groups in tests involving higher mental processes.

(5) Two special cases show that neuroses does not necessarily involve derangement of intelligence.

Distribution of scores in the individual tests.

A. VERBAL TESTS.

	XIV. 1.	XIV. 3.	XVI. 1.	XVI. 2.	XVI. 3.	XVI. 3(a)*	XVIII. 1.
Superior	100%	50%	100%	100%	100%	100%	50%
Medium	100%	87·5%	44%	65·4%	37·5%	62·5%	19%
Dull	33·3%	41·6%	...	37·5%	16·6%	33·3%	...
Total	70%	68%	35%	60%	37·5%	59%	14%

B. CONSTRUCTIVE TESTS.

	XIV. 4.	XIV. 6.	XVI. 4.	XVI. 6.	XVI. A1(2)	XVIII. 2.	XVIII 6.
Superior	100%	100%	100%	100%	75%	66%	100%
Medium	50%	81·2%	56·2%	56·25	18·8%	16·6%	44%
Dull	14·3%	66·6%	8·8%	16·6%	...	...	...
Total	48%	93%	44%	47%	18·8%	27%	46%

* Four pairs of Bengali Abstract words were used in XVI. 3 (*a*).

C. Immediate Memory Tests.

	XVI. 7.	XIV. 5.
Superior	75%	100%
Medium	60%	87·5%
Dull	16·6%	33·3%
Total	57%	70%

D. Arithmetic Tests.

	XIV. 5.
Superior	100%
Medium	68·7%
Dull	58·3%
Total	73%

A Study in Involuntary Movements

By

N. N. Sengupta and M. N. Samanta

The study of involuntary movements has been a matter of interest to psychologists for many decades. As a consequence, different kinds of automatograph have been devised and employed in the psychological laboratories. The suspended automatograph, the planchatte, and Sommer's 'tridimensional analyser' have long been in use. Several other contrivances were much in evidence in the earlier days of 'Psychical research,' when automatic writing and 'Thought-reading' were popular pastimes. At the Cambridge meeting of the international Psychological Congress, in 1923, *Dwelshauvers* presented a study of image-type in terms of involuntary movements. Yet, the correlation between these movements and psychic processes is far from being definitely recognised. The influence of affection upon automatic movements has, indeed, been fairly well-established. But as a 'method of expression,' the study of involuntary movements is still in its infancy.

One of the factors that has stood in the way of this line of work, is the difficulty in the matter of accurate measurements and quantitative estimate. For instance, the record obtained with the help of 'suspended' or 'planchette' automatograph, hardly ever lends itself to such treatment. A second difficulty lies in the absence of definite norm which may serve as standards for comparison. In fact, the psychophysiological conditions of involuntary movements which are studied with the help of automatographs are so complex that a reliable norm cannot easily be obtained. We have attempted, in the series of experiments reported here, to study the characteristics of a particular type of automatic movements.

Our purpose is to define their nature under normal conditions. Such a study is a necessary antecedent to any attempt at investigation of the relation of these movements with mental states.

The present study is mainly concerned with the involuntary tremors of a finger. Tremors possess a clinical interest for the physician. It is a symptom of many types of nervous disorder. The term in medical literature signifies a ' shaky and shivery movement of the whole body or of any particular limb.' These movements are visible and can be studied without the help of instruments. But there are also conditions of *generalised tremors.* The generalised tremor is characterised by " vibratory oscillations of variable intensity sometimes fine and limited to the extremeties." (Ref. Roussy and Hermitte—The Psycho-nuroses of war, pp. 55-59). The movements studied in this series of experiments differ from ordinary tremors that interest the physician, in two important respects. In the first place, the actual size of the oscillations is very small, about $\frac{1}{5}$ of a millimeter. They are barely noticed by the naked eye. In the second place, the subject is hardly ever aware of them.

We propose to report the result of two series of observations. The first series of experiments was undertaken in December, 1925. The second series began in January, 1926. The appliance employed in the first series consists of an aluminium writing lever 27cms. in length, fixed by two screws at 11cm. from the blunt end showing a magnification of 1 : 1·5. It is so balanced that a very small movement is capable of disturbing it. The writing lever is connected by a fine stretched silver thread to the middle finger of the right hand. The hand rests at an angle of 40° to 50°. The record is made on a kymograph. Time is traced by a Jacquet chronometer, marking 1 sec.

The second series of experiments differs from the first in as much as the ratio of the two parts from the fulcrum is 1 : 5, showing five times magnification.

The subjects are all students of Psychology. We had 5 subjects for the first series of experiments and 5 for the second. Two of these subjects have participated in both the series of experiments.

Not more than four curves of any subject have been taken on any single sitting. Ten curves have been taken of each subject in the first series. In the second series twenty curves have been taken of each individual.

Results :—

TABLE I.

First series.

Subject No.	Mode.	P. E.	No. of Tremors per sec.
1	23	·183	4·6
2	22	·221	4·4
3	26	·130	5·2
4	26	·226	5·2
5	25	·402	5·0

TABLE II.

Second series.

Subject No.	Mode.	P. E.	No. of Tremors per sec.
1	28	·2596	5·6
2	27	·2454	5·4
3	30	·1901	6·0
4	32	·2257	6·4
5	28	·2623	5·6

The amplitude of the movements recorded is so small that the variation in this respect cannot be calculated. We are preparing a new appliance which will render this possible. In these two series of experiments therefore, we have only obtained the record of frequency.

The tables I and II, present the modal values of frequency with the measure of error in the first and second series of experiments. These values have been calculated from 5 samples from each tracing. These samples have been taken from all the phases of the curves. Each sample is a record of 5 secs. Thus for the first series we have calculated the value from 50 samples for each subject and for the second series from 100 samples for each subject.

The tables show that the frequency of each subject remains constant for a number of days. The same conclusion is borne out if we note the percentage of error of each subject calculated from the average of all the records throughout this period of experiment in the second series.

TABLE III.

Showing Percentage of error.

Subject No.	Percentage of error.
1	1·24
2	·86
3	·60
4	·67
5	·75

Again we have stated above that we have had two subjects who participated in both the series. The interval between the two series is about 2 months and a half. Yet their frequency of tremors has not greatly changed as would be apparent from the table given below.

TABLE IV.

1st series		2nd series.	
Subject No.	Frequency.	Subject No.	Frequency.
3	26	2	27
4	26	4	32

Character of the curves:

The curves generally fall into two classes. Some of them over and above the indentations representing the tremors, show a wavy character. The others are linear. Some of them however combine both the features. This could be apparent from figs. 1, 2 and 3.

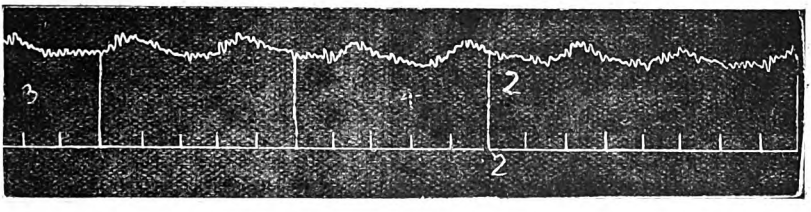


FIG. 1.

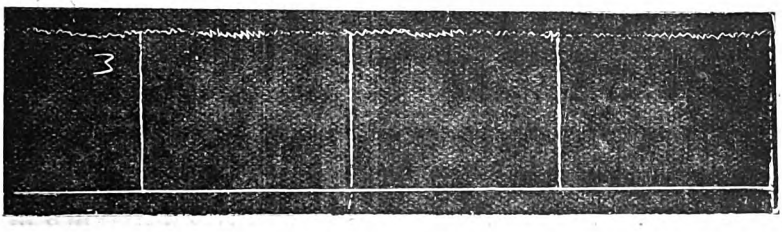


FIG. 2.

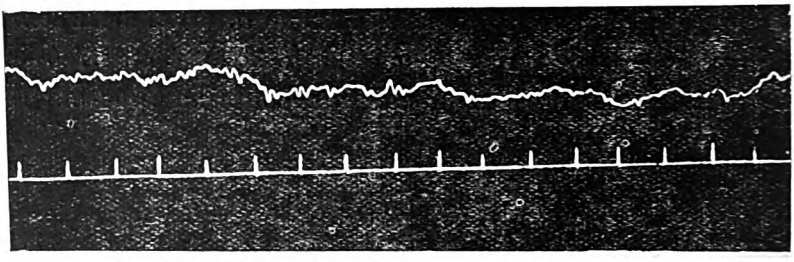


Fig. 3.

Table V.

Subject No.	No. of waves per minute.
1	24
2	21
3	20
4	24
5	24

The number as well as the nature of the waves clearly show that they are the effects of respiration. The experiments have also verified these two observations. The subjects are not generally aware of the tremors. But they are often conscious of these wavy movements.

Treatment of the data:

A study of the tables shows, as we have already pointed out, that the frequency of tremors is fairly constant for each subject, under the conditions of this experiment (tables I and II). Further the amount of individual variation as calculated from the record of all the individuals is 1·84, that is to say, about 6·33 per cent. of the average. Thus, the movement is caused by a set of factors that manifests but little change. Further, there is very little difference in the distribution of tremors in the different periods of experiments.

Table VI.

Subject No.	Frequency of tremors in each 5″ taken in order of sequence.
2	34 29 30 29 26 29 21 26 26 27 25 24 27
	27 27 23 25 26 24 30
4	29 28 31 32 33 32 31 32 31 33 32 31 29
	32 32

A number of readings have been taken when the subjects had to listen to music from an organ harmonium. The records show a slight increase in the number of tremors. But the amount of increase is so small that no conclusion can yet be drawn.

Table VII.

Influence of music.

Subject No.	Mode of normal tremors.	Deviation from Mode.	Mode of Tremors under Music.	M. D.	P. E.
1	28	3·00	31	3·38	·3409
2	27	2·61	34	3·64	·3301

Two tremor-curves were taken for each subject in order to test the influence of change of angle that the fore arm makes with the wooden support at the elbow-joint. The following table shows the results :

Table VIII.

Influence of change of angle.

Number of tremors as obtained with the variation of the angle of the hand.

Subject No.	Angle.	No. of tremors in a period of 5" secs.					Average.
2	60°–70°	36	34	34	37	38	35·8
	30°–40°	36	36	35	32	37	35·2
4	60°–70°	37	34	36	35	33	35·0
	30°–40°	37	35	36	31	33	34·4

Generally viewed, there seems to be a change due to the variation of the angle. But the increase accompanies not only an increase but also, a diminution of the angle from the 'normal' position at which most of the tracings have been taken. Moreover, the subjects, on certain days, trace a larger number of tremors than on others.

TABLE IX.

Daily variations in the tremor-frequency.

Table showing the variation of tremors at different dates.

Subject No.	Date.	No. of tremors in a period of 5" secs.					Average.
1	9. 1. 26	20	21	24	20	25	22·0
	28. 1. 26	28	30	29	31	29	29·4
2	29. 1. 26	22	24	22	25	23	23·2
	19. 2. 26	31	35	32	32	31	32·2
3	30. 1. 26	26	25	26	27	27	26·2
	4. 3. 26	36	31	36	33	32	33·6
4	13. 5. 26	27	27	26	27	26	26·6
	17. 5. 26	32	32	35	39	33	34·2
5	22. 1. 26	29	29	24	28	29	27·8
	19. 3. 26	36	37	34	38	33	35·6

In view of this, it is difficult to say whether the increase in question possesses any significance.

The basis of the tremors should be sought in a set of pyhsiological processes that remain constant under the conditions of these experiments. The general character of the movements suggests that they are what has been called "Reflex tonus." "Reflex tonus," says Sherrington, "is the expression of a neural discharge concerned with the maintenance of 'attitude.' The antagonistic muscles would have to be inhibited in order that a particular posture may be maintained. This process could be accompanied by slight

reflex contractions" (Sherrington: Integrative Action of the Nervous System, 1915, p. 340). The tracings under consideration are the effects of these reflex contractions. The exact mechanism of these reflexes is yet a matter for investigation. But they appear to be influenced by central factors. (Howell—Physiology, 1923, p. 52). Further experiments are necessary for testing whether these movements can be definitely correlated with psychic processes.

Notes and Abstracts

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The problem of Inhibition. Theories of Inhibition (1) and (2),—by Raymond Dodge.

The problem of inhibition was brought into importance through the discovery of the effect of the Vagus on the heart and the influence of the higher centres on the reflexes. The researches of Sherrington show that Inhibition is a conserving process. It leads to the economy of energy through a fine grading of the strength of reactions and through their rhythmic alternation. In psychology the fact of inhibition has been employed as a principle of explanation in a number of different systems. In Herbertian Psychology, the 'dynamics of ideas' is essentially a description of the process of inhibition. Wundt's apperceptive function in the ultimate analysis is an inhibitory function. Inhibition is regarded as the basic fact in the Psycho-analytic school of to-day. It has been largely employed in the explanation of attention, memory, choice, conflict of impulses, rivalry of sensory stimuli and practice.

An analysis of the process reveals the fact that there are several kinds of inhibition: (1) We shut our jaw to keep back speech or open the eyes wide in order to prevent winking. In these cases, a mechanical-peripheral process is induced in order that a movement may be checked. (2) There are processes of hesitation and 'block' due to the interplay of opposed motives or contradictory ideas. (3) The decrease in the effectiveness of a stimulus when it follows a similar one in quick succession, when in other words, the second stimulation comes in the 'refractory phase' of the first. (4) Voluntary

deadening of an activity. (5) Inhibition of a reflex due to rivalry, for instance, rivalry between visual and vestibular stimuli. (6) Inhibition of a stimulation by one of greater intensity, as represented in Heyman's law. (7) Inhibition through prejudice, set, association, etc. (8) Central inhibition by which excitability is gradually diminished through a series of stimulations. Of the many theories brought forward for the explanation of the phenomenon of inhibition, three are of special importance. According to the first of these, inhibition results from the operation of a special centre. For Langendorf the optic lobes are the inhibitory centres. For Wundt it is the frontal lobe which possesses certain nodal points of conduction whose abrogation produces disturbances of an intrinsically elementary character. For Wundt, inhibition is essentially a result of the restoration of energy, " Every process of stimulation produces two opposite effects in the nerve fibre. The one set of operations will be directed upon the production of external work (muscular contraction, etc.) and the other upon the recovery of the work thus liberated. We may term the former excitatory and the latter the inhibitory effects of stimulation."

The second important theory is the well-known Drainage hypothesis of James and MacDougall. Neither theoretical considerations nor experimental evidence supports the theory.

The third significant hypothesis is that of the Refractory phase. Refractory phase is a period of decreased excitability subsequent to stimulation, in which there is a re-establishment of the equilibrium. In simple structures, this restoration takes place quickly. In complex structures as well as in mental life, the period is much longer. This hypothesis too, cannot explain all the types of inhibition.

Is Cerebrum the seat of thinking : *J. F. Dashiell.*

The thought process is ordinarily supposed to correspond to a cerebral stimulation. But when the perception of

meaning, concepts and general ideas are analysed they are found to be "reducible to a pattern of responses explicit and implicit." Similarly "Bewusstseinslage" "Aufgabe" and "Einstellung" are essentially processes of motor-adjustment. "Thinking thus becomes in a true, and not rhetorical sense, a man's actually adjusting himself and his doings."

The function of the emotions : H. H. Britan.

Three classes of stimuli evoke emotions: (1) objects and situations, (2) perception of emotional excitement in others, and (3) ideas and images. Of these, the last factor seems to have been neglected. A recognition of its importance leads to the conclusion that "emotions are due more to central factors than to peripheral ones. The particular function of the emotions would seem to be to raise the 'nervous potential' so that immediate and vigorous action is assured."

The major categories of Psychology : Madison Bentley.

The paper presents an interesting, and lucid resumé of the leading tendencies of psychology preceded by a page or so of parody of psychologists and their systems. Behaviourism and Gestalt theory receive a large share of attention. Psycho-analysis is considered in its relation to general Psychology.

Principles of work decrement : E. S. Robinson.

The decrement of work through exercise as well as its increment through practice are basic facts of behaviour. The magnitude of this decrement is subject to large variations. The causes of this variability, however, have not been analysed. The general factor that leads to the decrement is said to be fatigue. But the conception is too simple to be of service in the explanation of work-curve.

Dodge has attempted to formulate certain principles in the light of the 'Refractory phase hypothesis, termed by him the laws of relative fatigue.' These are: (1) "within physiological limits, all fatigue decrement in the results of work is relative to the intensity of the stimulus." (2) "In any complex of competing tendencies, the relatively greater fatigue of one tendency will tend to eliminate it from competition in favour of the less fatigued tendencies." Taking these as basis, Robinson has proceeded to formulate a more systematic set of principles for the explanation of decrement. He believes that the phenomenon of decrement can be more adequately described in terms of the stimulus-response scheme. The laws are: The work decrement of a given S-R (Stimulus-Response) connection is relative to the (1) recency of the previous functioning of that connection, (2) frequency of the previous functioning of that connection, (3) connections between that S and other R's, (4) strength of the specific connection, (5) qualitative integrity of S throughout the work period during which the decrement develops, (6) quantitative constancy of S throughout the period, and (7) decrements which have developed in other S-R connections.

Critical Comments on the 'Gestalt Theorie': *M. W. Calkins.*

By 'Gestalt' is meant a unity which is an 'undivided, articulated whole.' When two squares of gray card-board are seen side by side upon a background and one is judged to be brighter than the other the experience does not consist in independent perceptions of the two pieces; there is a unit experience in which there are two levels of brightness and a rise from one to the other. The ascent is not a separate perception but 'a central property of this undivided experience.' Gestalt Theorie is thus a protest against atomism of all types.

The 'Gestalt Theorie' is supported by two lines of evidence: (1) Experimental study of certain human

experiences mainly perceptual. (2) Studies in animal behaviour which indicates the continuity and unitary character of reactions to the environment. Under the first heading, we may subsume the following: (1) Experiments of Wertheimer in which he investigated the illusion of movement arising from the successive presentation of static figures. (2) Experiments of Lindemann with visual figures such as circles, triangles, etc. which show expanding and contracting movements upon sudden illumination. (3) Köhler's experiments with successively presented tones which give rise to an experience of 'ascending,' 'descending' or 'progressing.' (4) Rubin's experiments with puzzle pictures. Under the second head may be mentioned Köhler's experiments with chimpanzees.

The following points are raised in criticism: (1) 'Gestalt' principle is not the only principle of psychological description. All experiences cannot be effectively distinguished from one another by the manner of their integration.

(2) Gestalt Theory assumes that analysis would inevitably lead to atomism. If an observer is to grasp the nature of wholes, he must assume the attitude of the wise old doctor or of the diplomatist. This sounds like the pre-scientific view, the point of view of the 'plain man.'

(3) The Gestalt Psychologist neglects the concept of the experiencing individual.

(4) The Gestalt Psychologist urges that the psychic Gestalt corresponds to a physical gestalt and both form aspect of a larger whole. This is a progress from speculation to speculation.

(5) The Gestalt Theory claims to have introduced a new point of view. But long before the advent of the Gestalt theory we find the same views in James. The protest against atomism, the perception of wholes and even the idea of a physiological Gestalt are to be found in James' work. Yet James was untouched by the new point of view.

Sir Charles Bell: A contribution to the history of Physiological Psychology: Leonard Carmichael.

Bell's contribution to the physiology of Reflex action is well-known. The structural and functional difference between the motor and the sensory nerves may also be traced to Bell. The doctrine of the promiscuous conductivity of nerves, was abandoned only after Bell's discovery. Thus, what is usually called James' 'law of forward direction' in the nervous system was anticipated long ago. In the same way, as Professor Dessoir has suggested, the doctrine of specific energy of sensory nerves may be termed one of Bell's laws. The fact of muscle sense was first mentioned by Bell whose analysis of sensory functions too, deserves mention. The reciprocal innervation of antagonistic muscles as well as the study of expressions in their relation to emotions, may also be credited to Sir Charles Bell.

Other articles of interest are: *Local signs as orientation tendencies* by Joseph Peterson, and *The concept of Retroactive Inhibition* by E. B. Skaggs. An abstract of Skagg's monograph on the subject has been given in No. 2 of this volume.

Calcutta University. N. N. Sengupta.

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Persistent Problem in Systematic Psychology: The Psychological Datum—by R. H. Wheeler.

In this paper the author discusses the concept of the Psychological Datum and shows that, used systematically, this concept of the 'given' leads to a dilemma, namely, "that of forming content alone upon a situation in nature which must inevitably be regarded from the functional as well as

the structural view-point." He maintains that an experience and its cognition, a mental process and its meaning are neither to be treated as separate nor are they to be made one. To treat the process and its meaning as separate would be equivalent to positing that "idea is never conscious; only the reflection that follows; not even that but only the next and so on ad infinitum." We are thus never aware of anything. Again to treat them as one, as unity without parts is illogical. The datum is thus to be treated as 'content-in-use' having both structural and functional properties. The distinction between process and meaning is not only artificial but dangerous, except as a way of expressing different degrees of analysis and control of a situation.

Mechanism and Taleology in Psychology: by H. C. Warren.

At present two radically opposed conceptions are held by Psychologists. The mechanistic theories explain mental occurrences in terms of physical and chemical transformation while the Taleological theories posit Directive Consciousness at the basis. This paper examines from an empirical standpoint the nature of the opposite theories and practically supports the mechanical view.

Purpose and Cognition: The Determinations of Animal Learning: by E. C. Tolman.

The primary object of this paper has been to demonstrate the fruitfulness of some sort of purposive (goal-seeking) and cognitive (object-adjustment) categories applied to learning. The physiological categories, such as, stimulus, neural excitation, synaptic resistance, muscle contraction, gland-secretion, etc., which are usually employed to explain animal learning are inadequate. These new terms 'purpose' and

'cognition' are however not used mentalistically but purely from behaviouristic standpoint.

General Aspect of the Conditioned Response: by Hulsey Cason.

This paper describes some general characteristics of the Conditioned Response which are not commonly recognised. As a principle of learning in animal life it is a legitimate subject for psychological investigation and has already engaged the attention of a large number of Psychologists. He maintains that if two stimuli-response area are active simultaneously on several occasions, there is a possibility that two conditioned responses may be formed instead of only one. The conditioning takes place in the central nervous system and not in the neurons. Image and perception may be acquired by this principle. Thinking is largely a function of habit and is not limited to the activity of the central nervous system.

Contribution to the Psychology of Nutrition: Hunger and Appetite: by James L. Mursell.

The author here challenges the view of Cannon, Carlson and Washburn that the act of food-taking is dependent on two correlative but more or less independent factors, Hunger and Appetite, and attempts to establish a different theory of his own. He shows by citing several instances that ingestion of food is not throughout motivated by peristaltic contraction of the fundus of the empty stomach. The first of the basic elements that regulate ingestion is sucking, the most innate and organised internal reactions of mammalian young. Concomitantly with sucking appears the gastric hunger contractions, and connection is next set up between the two sets of relations. The selection of specific food,

however, is influenced by a positive chemotropism for certain food which is at the basis of appetite. The desire for food is then a unit behaviour depending on various factors and not attributable to one or other among them.

Discussion—Series of Blacks, Grays & Whites: *by Forrest L. Dimmick.*

It is a discussion on an article by Neifeld in support of the Ladd-Franklin Theory of vision which appeared in Psychological Review, Vol. 31, Page 498. The writer maintains that a stimulus whose physical value is zero is not equivalent to zero stimulation or excitation. Negation of light does not necessarily give rise to the sensation black. Zero stimulus arouses the sensation black only when it is preceded by or when it is adjacent to white stimulation. But when it is preceded by or adjacent to red stimulation the sensation of green is produced. Thus the single intensity of blackness which should be correlated with single intensity of zero fails to stand.

Feni College, Bengal. N. DASGUPTA.

Introduction to Experimental Psychology: *by C. W. Valentine, M. A. (Cantab.).*

The book contains two parts. The first XIX chapters deal with very elementary experiments on topics like 'Economical methods of learning,' 'On the value of a map,' 'The appreciation of poetry and picture,' 'Experimental tests of general intelligence,' 'Observation and recall,' etc. The second part discusses the results of experiments and shows their application to school children.

The special merit of the book is that it dispenses with the expensive apparatus, discusses topics of immediate interest to the student of Educational Psychology and carries on all its experiments with the help of pen and paper only.

The book will commend itself particularly to the student of General Psychology who is just entering the laboratory of Experimental Psychology, and also to the teachers and pupils in Training Colleges for whom it is really meant.

Lucknow. J. EDWARDS.